



**Marine Nature Conservation Review:
Rationale and methods
(Summary report)**

edited by
Keith Hiscock

Joint Nature Conservation Committee

Monkstone House, City Road

Peterborough PE1 1JY

UK

Introduction

The variety of marine habitats in Britain is tremendous - the greatest of any European state with an Atlantic coast - from the rugged wave-beaten Atlantic shores of northern Scotland to the still, muddy backwaters of southern estuaries. The range of coastal topography includes rocky islands, extensive sandy coasts, tide-swept sounds, steep-sided sealochs and isolated brackish lagoons. The waters around Britain are crystal-clear in offshore areas but are described as being like liquid mud in some tide-swept estuaries. The temperature of shallow waters range from those described as warm temperate to those of cold temperate conditions. This great range of environmental conditions is reflected in a wide variety of plant and animal life forming different communities according to the combination of geographical position and local environmental conditions. Conserving the consequent high biodiversity requires information on which to base decisions on environmental protection and management, including the best locations for marine protected areas. Acknowledging these requirements, the Marine Nature Conservation Review (MNCR) was commenced in 1987 by the Nature Conservancy Council with the objectives of:

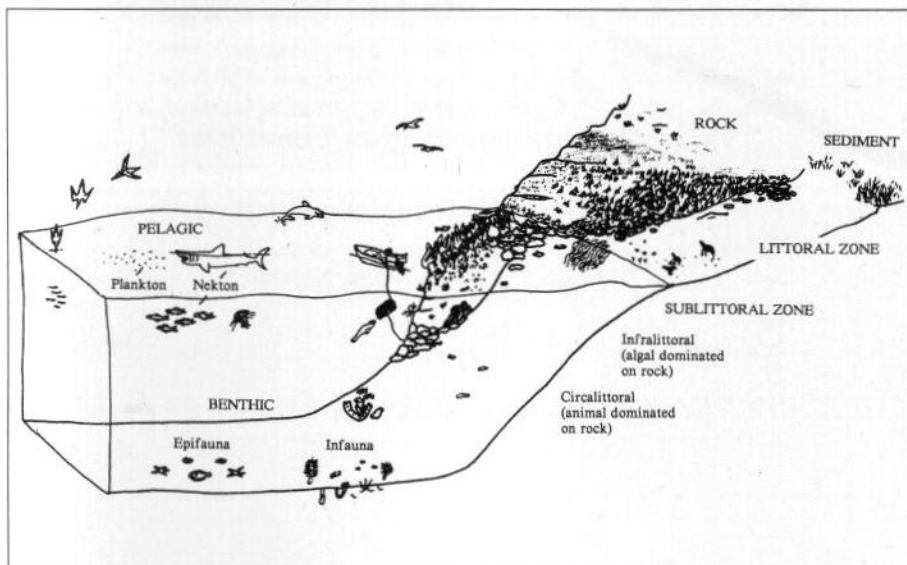
- extending our knowledge of benthic marine habitats, communities and species in Great Britain, particularly through description of their characteristics, distribution and extent;
- identifying sites and species of nature conservation importance.

The data collected also provide information to support more general measures required to minimise adverse effects of development and pollution, particularly on sites and species of nature conservation importance.

Subsequent to the Environmental Protection Act 1990, the MNCR has been undertaken by the Joint Nature Conservation Committee (JNCC) on behalf of the Countryside Council for Wales (CCW), English Nature (EN) and Scottish Natural Heritage (SNH). Country agency staff contribute to the development of MNCR methods for survey, assessment and reporting and take forward results of MNCR work to identify the nature conservation importance of sites including in relation to potentially damaging activities.



Marine habitats and their associated communities of species in Britain range from those characteristic of wave-sheltered rocky and sedimentary coasts to those extremely exposed to wave action. In the Isles of Scilly, this range of conditions is encapsulated within a small archipelago. View across Tresco towards Round Island (Roger Mitchell/JNCC).



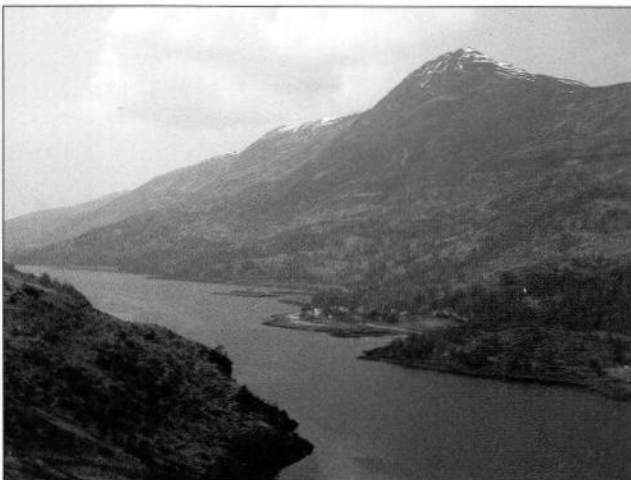
Marine ecosystems. Drawing by Keith Hiscock.



Extensive areas of intertidal sediments which continue into the subtidal occur on many coasts, particularly in the northern Irish Sea and south-east England. Sandy beach at Black Rock Sands, North Wales (Keith Hiscock/JNCC).



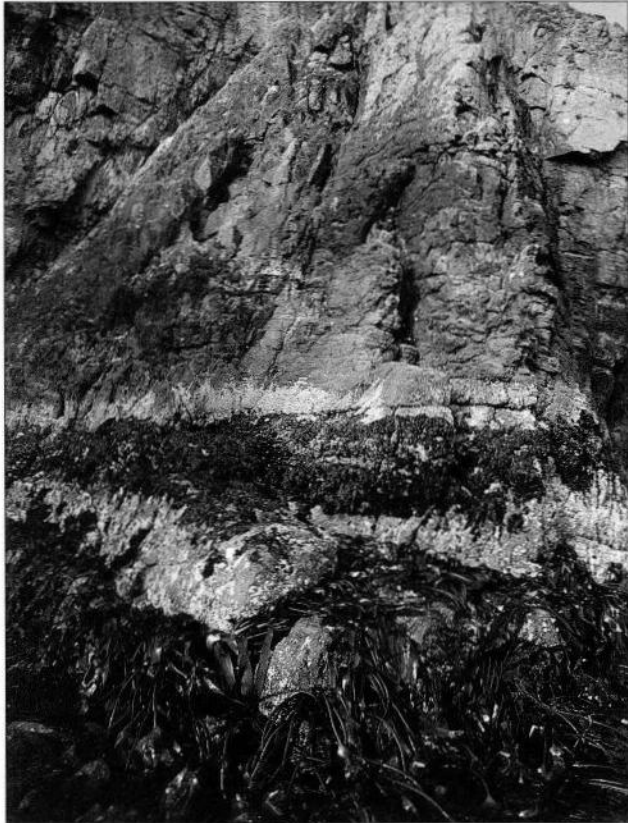
Chalk rock attracts particular species and communities but is rare in Europe; England has approximately 75% of the European chalk coast. Chalk cliffs and platform at Handfast Point, Dorset (David George/JNCC).



(left) Fjordic sealochs with steep rocky sides often extending into deep water and partly separated from the open coast by sills include highly distinctive sediment and rock communities. Loch Leven (Keith Hiscock/JNCC).



(left) Lagoonal habitats in Scotland occur in flooded glacial landscapes particularly in the outer Hebrides where marine communities are present in rock-bound ponds many kilometres from the open sea and connected only by narrow channels. Loch Obisary, North Uist (Frances Dipper/JNCC).



Rocky shores exhibit a distinctive zonation of species determined by tidal rise-and-fall and wave splash. A band of yellow and grey lichens is followed by bare rock or rock covered by black lichen with small gastropod molluscs; then barnacles with, in shelter, furoid algae; limpets and barnacles with mussels. In sheltered conditions, the midshore rocks are dominated by brown algae. The lower shore is general dominated by red foliose algae with thong weed, then coralline algae and kelp near to low water level. Brei Holm, Papa Stour, Shetland (Keith Hiscock/JNCC).



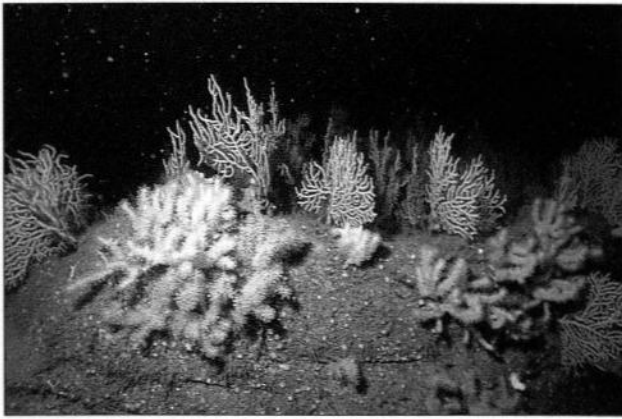
The vertical zonation of species on underwater rocks is determined mainly by the attenuation of light with increasing depth. Dense forests of kelp (mainly *Laminaria hyperborea*) in shallow depths extend to kelp park and rocks dominated by foliose algae (except where grazing by sea urchins and molluscs is heavy) then to rocks dominated by animals. Wherever grazing or sand scour are high, the crustose algae which cover the rock are the most obvious cover. Farne Islands, Northumberland (Sue Scott/JNCC).



A mosaic of sponges, ascidians, jewel anemones and the anemone *Phellia gausapata*, characteristic of wave exposed rock. Rockall, 33 m depth (Sue Scott/JNCC).



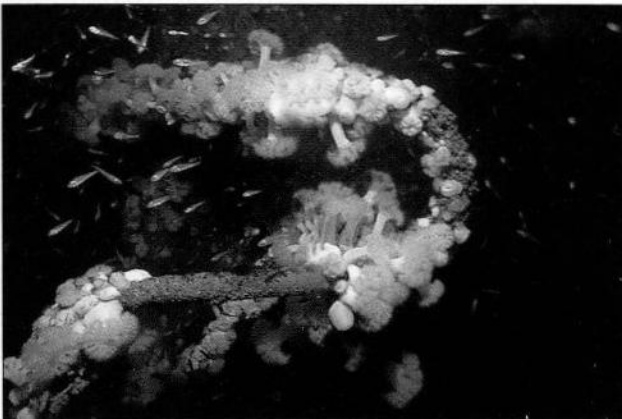
Shetland is the only location in the British Isles where the northern sea urchin *Strongylocentrotus droebachiensis* occurs in significant numbers. The Skerries, Shetland, 20 m depth (Sue Scott/JNCC).



Forest of the southern sea fans, *Eunicella verrucosa*, with red sea fingers, *Alcyonium glomeratum*, occur only off extreme south-western coasts of Britain. Plymouth Sound, South Devon, 32 m depth (Keith Hiscock/JNCC).



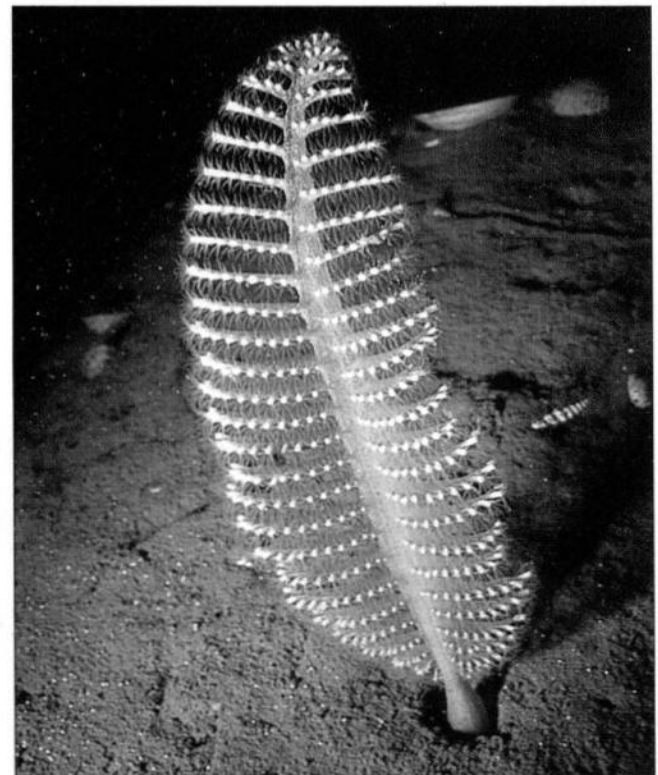
The sea anemone *Protanthea simplex* and brachiopod *Neocrania anomala* together with feather worm *Sabella pavonina* and brittle stars, *Ophiothrix fragilis*, characteristic of circalittoral rock in Scottish sealochs. Loch Duich, Skye and Lochalsh, 18 m depth (Sue Scott/JNCC).



Artificial structures built or lost in the sea provide habitats often colonised by communities not otherwise present in the area. Deck rail dominated by the plumose anemone *Metridium senile* on the wreck of the MV Robert, Lundy, 17 m depth (Chris Lumb/JNCC).



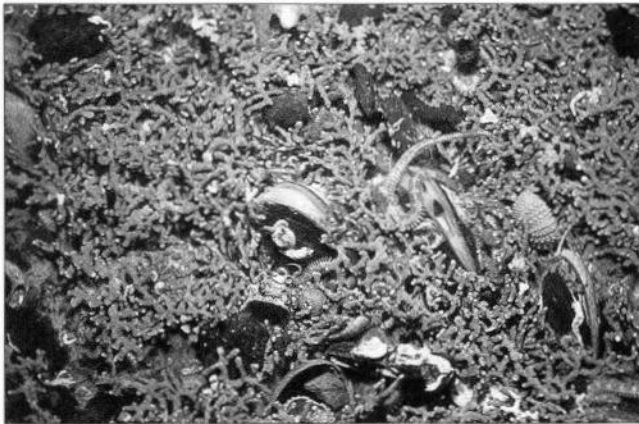
Sand colonised by beds of seagrass *Zostera marina* in shallow depths. English Island, Isles of Scilly, 2 m depth (Keith Hiscock/JNCC).



The sea pen *Pennatula phosphora* in mud characteristic of wave-sheltered areas. Ard-an-Eoin, Loch Duich, Skye and Lochalsh, 20 m depth (Keith Hiscock/JNCC).

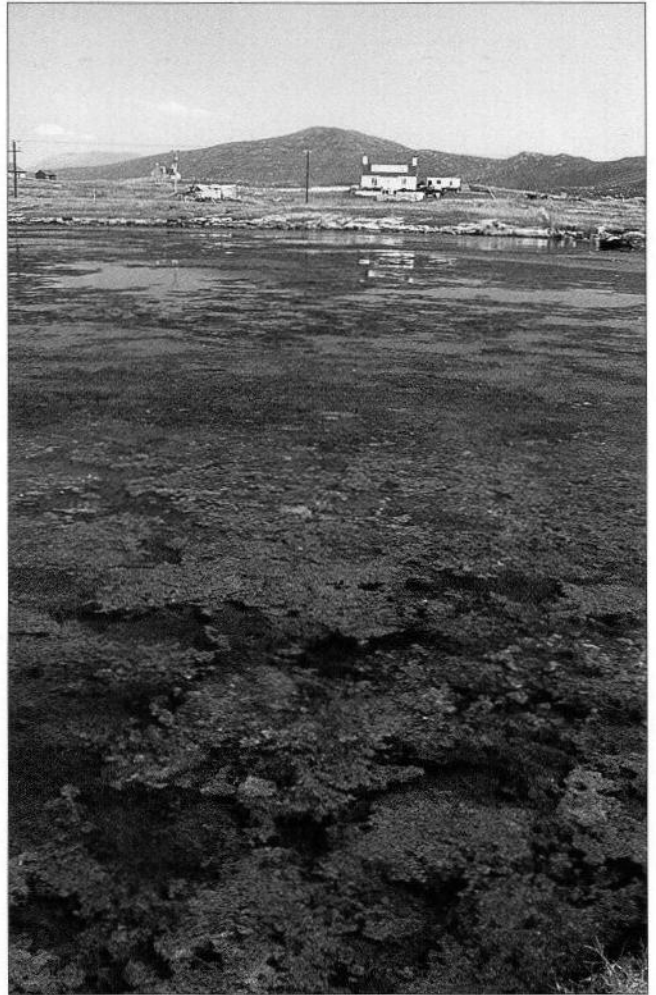
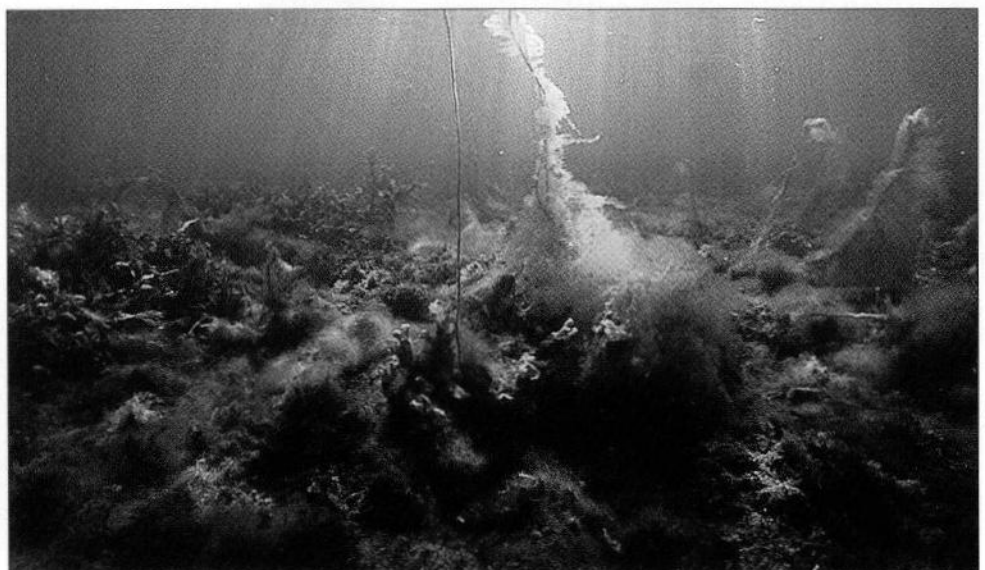


Part of a deep muddy shell gravel community sampled by dredge and including the starfish *Astropecten irregularis* and *Asterias rubens*, the bivalve *Phaxas pellucidus*, tubes of the polychaete *Pectinaria koreni*, the crab *Liocarcinus depurator* and the seapen *Virgularia mirabilis*. Vaile Sound, Shetland, 40 m depth (Keith Hiscock/JNCC).

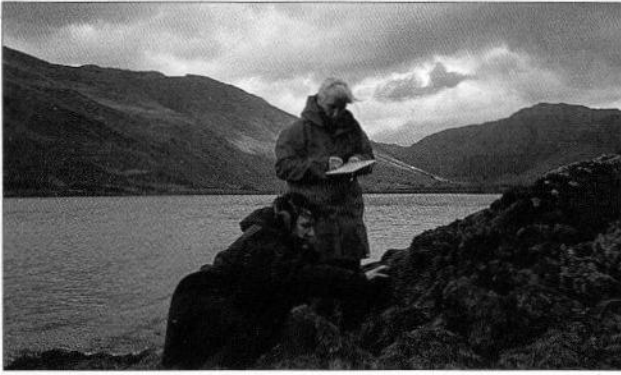


Close-up photograph of a maerl (*Lithothamnion corallioides*) bed with horse mussels *Modiolus modiolus* and the brittle star *Ophiopholis aculeata*. Loch Carron, Ross-shire, 12 m depth (Keith Hiscock).

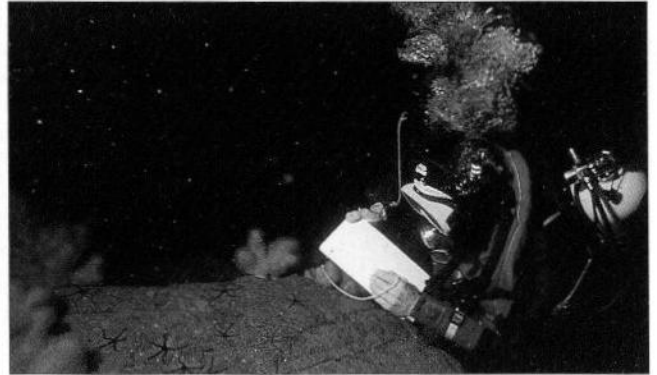
Shallow sediments in lagoonal habitats are typically covered in a mat of loose-lying algae or algae attached to small stones and shells including fucoïds, filamentous red and green algae and with cord weed, *Chorda filum*, often present. An-T-ob, Kyleakin, Skye, 1 m depth (Sue Scott/JNCC).



On the west coast of Scotland and especially the Outer Hebrides, lagoonal habitats are mainly rock-bound basins connected by narrow channels to, but often a considerable distance from, the sea. The stagnant state of this lagoon is indicated by the pink bacterial crust. North Loch Boisdale, South Uist (Sue Scott/JNCC).



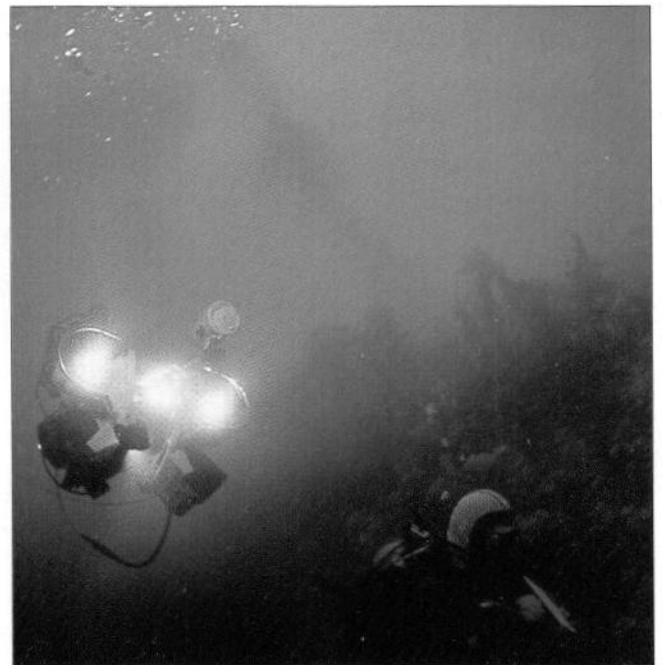
Surveys of rocky shores are carried out by recording the abundance of all conspicuous species within a habitat. Loch Beg, Loch Duich, Skye and Lochalsh (David Connor/JNCC).



Diving is used to record the abundance of conspicuous species on sublittoral hard substrata. Holes of Burro, Shetland (Sue Scott/JNCC).



Littoral sediments are sampled by coring followed by sieving of samples and identification of all collected species. Digging-over the sediment identifies large widely dispersed species. White Sands, Torness, Lothian (Eleanor Murray/JNCC).



A Remotely Operated Vehicle (ROV) with video recording can be used to identify biotopes and to direct MNCR survey teams to particular features or representative sites. Photographed during an exercise to compare video and diver recording. Ardnamurchan Point, Argyll (David Ainsley).



Remote sampling by grab is used to sample biotopes over extensive areas of sediment. Northumberland coast (Aquatic Environmental Services/JNCC).



During diving-based surveys or in areas where sediments are restricted in distribution, coring by divers, together with digging over the sediment for large widely dispersed species is used to record from sublittoral sediment biotopes. Ceredigion coast (Paul Brazier/JNCC).

● Indicates information being collected or interpreted by the MNCR.

Box 1: Marine nature conservation requires information on:

- the type and distribution of habitats and their associated communities of species (biotopes);
- the distribution of species;
- the relative quality of sites for their marine biotopes and species;
- the key non-biological features which determine species and biotope distribution;
- the natural fluctuations in species composition within communities;
- the functional and reproductive biology, physiology and natural population dynamics, including longevity of species;
- the effects or potential effects of human activities on benthic marine habitats, communities and species;
- the location and extent of human activities and whether they are affecting the natural heritage interest of sites;
- the location and status of existing protected sites;
- the location and status of protected species.

Scope of the MNCR

The geographical area within the statutory remit of the country nature conservation agencies and JNCC is England, Scotland and Wales. It excludes Northern Ireland and the British Crown Dependencies of the Isle of Man and the Channel Islands.

In order to obtain the most pertinent information from the vast area holding marine habitats and species within British jurisdiction, it has been important to ensure that the MNCR programme is clearly focused to meet the immediate priorities for conservation. This has meant identifying those areas, both widescale and more localised, where survey is most required to support wildlife conservation and identifying the habitats and species which should be surveyed. The type of information collected has also been influenced by practical aspects of working in the marine environment, including constraints of environmental conditions, equipment capabilities and cost, as well as by the techniques and expertise available.

Taking these various considerations into

account, the focus of MNCR work is therefore on benthic habitats and their associated communities, which together are described as 'biotopes', in inshore areas.

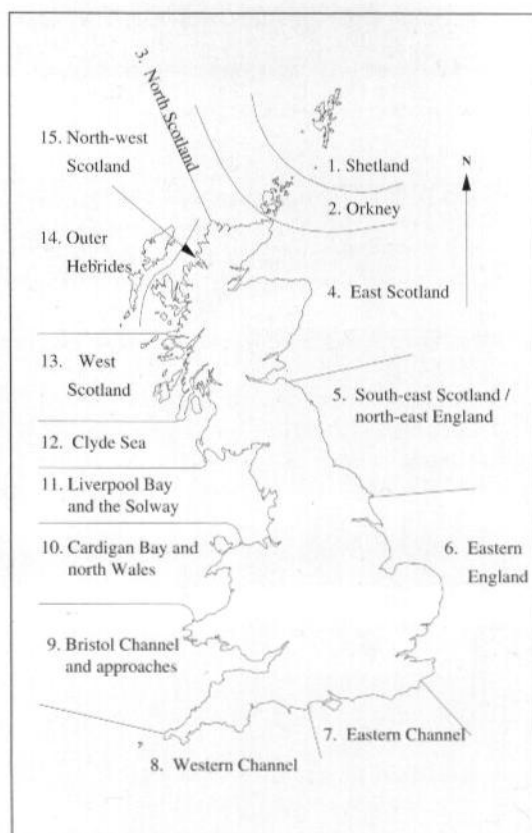
The extent of this inshore coastal zone varies but is generally taken to reach about 3 miles or 5 km offshore. The coastal zone includes both sediment and rock habitats and is particularly affected by wave action on the open coast, by shelter from wave action on enclosed coasts, by the presence of turbid water and by the acceleration of tidal currents by coastal features. Plumes of turbid, low salinity water from large estuaries such as the Humber or offshore emergent features such as the Sarns in Cardigan Bay may effectively extend habitat features of the coastal zone and consequently require survey effort further offshore. The 50 m depth contour is also important as it is approximately where offshore areas of low-turbidity, seasonally-stratified waters meet those inshore which are generally of higher turbidity and are well-mixed throughout the year. It is also the depth below which wave action is unlikely to have

Box 2: The MNCR has concentrated work on habitats dominated by marine and brackish water macrobenthic species within the coastal zone usually shallower, on the open coast, than 50 m depth because of the following key points:

- the biotopes and species have not been included in previous comprehensive reviews aimed at establishing natural heritage importance;
- it is the area of sea where the greatest variety of biotopes occurs;
- the area near the coast is highly affected by a wide variety of human activities;
- the area within the 3-mile and, to a lesser extent, the 12-mile limit of territorial seas is subject to legislation allowing for the creation of statutory wildlife conservation areas;
- extensive comparative survey of benthic habitats in the inshore zone can be carried out within the limits of finance and readily available technology;
- the coastal zone and its natural features is the area of most immediate interest or concern to the majority of people.

a substantial effect on the seabed on the open coast.

Even restricting the area on which the MNCR primarily focuses to the coastal zone, there remain many tens of thousands of square kilometres of shore and seabed to consider. The task of review and survey has, however, been made more manageable by dividing the coast into fifteen physiographically or biogeographically distinct zones, the MNCR 'coastal sectors'.



The MNCR coastal sectors

The MNCR database

All aspects of the MNCR are supported by a powerful database which enables rapid access, manipulation and dissemination of data. The database is also held by each of the country nature conservation agency marine teams.

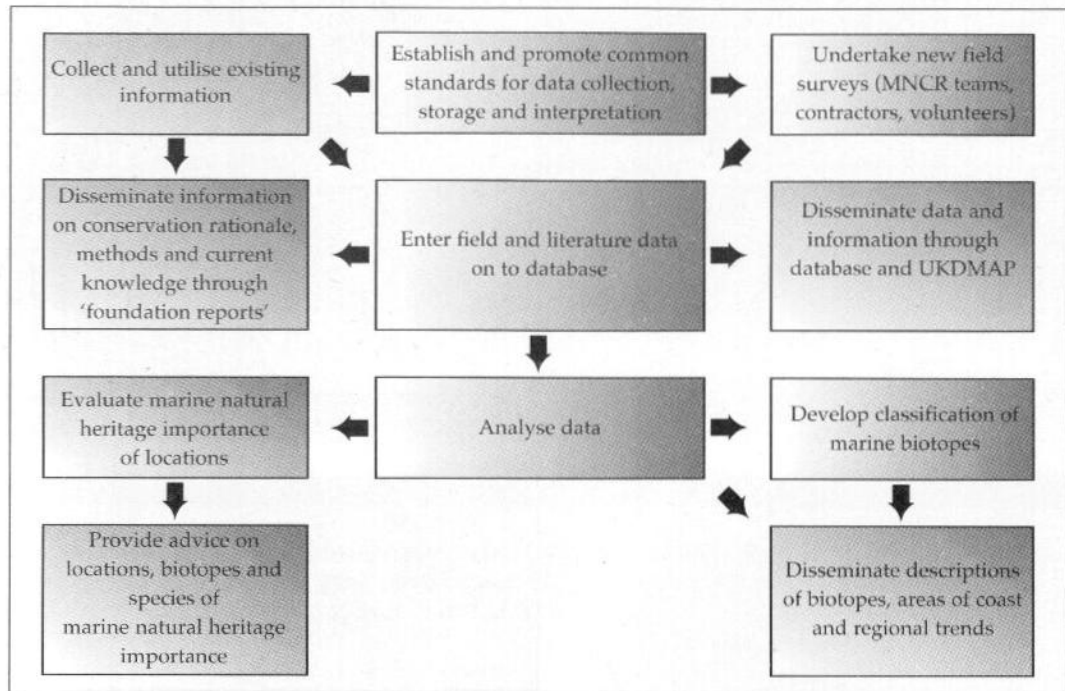
Information can be exported from the database for display using UKDMAP (United Kingdom Digital Marine Atlas Project) software. Information on sites surveyed and reported in the literature are available on commercial copies of UKDMAP.

Box 3: The computer database is used for the following activities within the work of the MNCR:

- access to bibliographic holdings including literature searches through geographical location, keywords, author or taxa;
- preparation of reference lists;
- survey reporting including lists of locations surveyed and species recorded;
- access to photographic holdings and generation of labels for transparencies;
- mapping of distributional information, for instance of species and biotopes;
- analysis of field data through classification and ordination programs;
- assisting with the development of the biotopes classification through data analysis;
- survey planning through identification of available information;
- application of the conservation assessment protocol (for comparison of diversity between areas, sites and within the same biotope);
- providing summary information on protected sites;
- support for the marine advice service through generation of selected information on particular locations, species etc. as required;
- access to addresses and production of address labels.



Main elements of the programme



The MNCR programme has seven main elements.

1. **Collation and assessment of existing information** Three main types of existing information are used by the MNCR.

- i. **Information which contributes to marine conservation issues** Where information is relevant to the work of the MNCR it is reviewed and incorporated into the *literature review* module of the MNCR database. Each paper, book, report or other item of information receives a reference, keywords, an abstract and, where relevant, an indication of its geographical coverage.
- ii. **Site-specific survey information** Site-specific details of marine biological surveys are incorporated into a *literature sites* module of the MNCR database. Here the source reference, the types of survey undertaken and the specific location of each site are recorded. Through display on mapping facilities within the database, this module provides a rapid indication of where surveys have been undertaken and is particularly useful in responding to site-specific issues of marine conservation management.

iii. **Survey information which enables full description and/or conservation assessment of the site** Where survey information has been collected to similar standards and aims as that of MNCR field surveys, and therefore can contribute to the detailed description of habitats and their component species or to the assessment of marine natural heritage value, it is incorporated into the *field survey* module of the MNCR database.

2. **Undertaking new field surveys to fill gaps in knowledge** Before the start of the MNCR, large stretches of coast were poorly surveyed or lacked studies where data were collected for nature conservation aims. The surveys undertaken by the MNCR aim to give a broad but comprehensive overview of the range of habitats present, from which locations of high nature conservation importance are identified. For practical and economic reasons the surveys do not attempt to map in detail the distribution of habitats present in each sector although recent techniques such as acoustic mapping can provide such information.

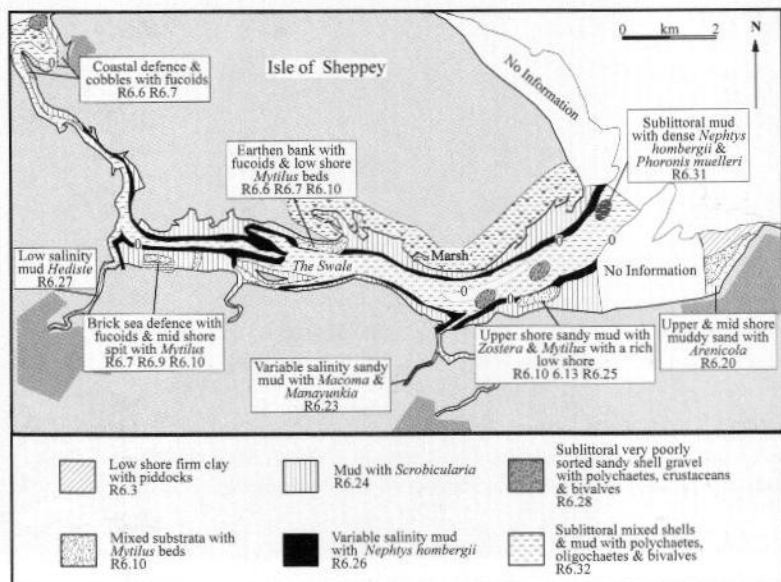
The MNCR uses reconnaissance, inventory and mapping surveys as a first step in determining the locations of sites for the more detailed surveys which provide the

information needed for site comparison and assessment. Survey work undertaken by the MNCR requires the use of a variety of techniques depending on substratum type and environmental conditions. Hard substrata are surveyed directly by recording the abundance of the conspicuous species present. For sublittoral areas, this requires diving and, for depths below 50 m, video photography. Sediments are described directly and samples are taken usually by coring *in situ* or remotely by grab sampling. Records of habitats and flora and fauna are supported by photographs and specimens.

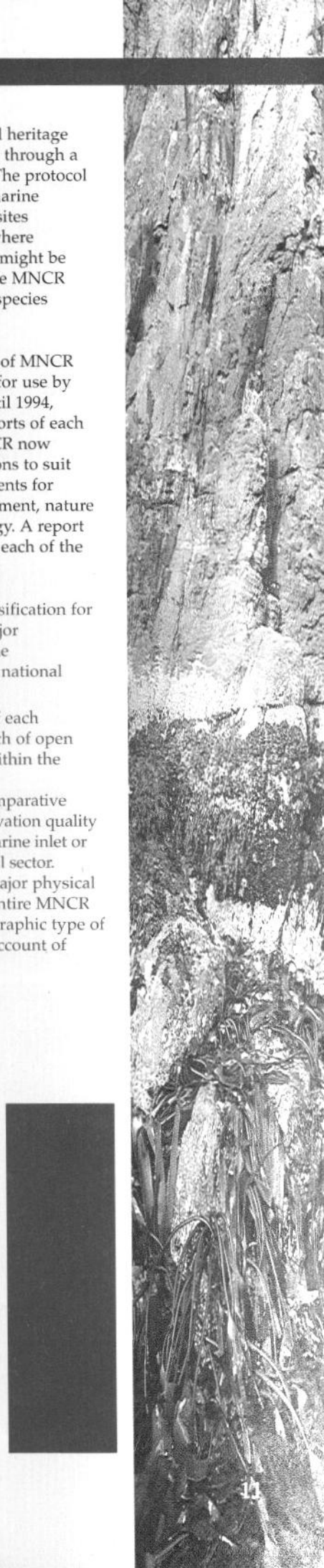
3. **Setting standards for data collection, storage and interpretation** The MNCR establishes and promotes common standards for field survey methods, data storage through the MNCR database, data interpretation and conservation evaluation both nationally and internationally.
4. **Classifying marine biotopes** The MNCR is developing a marine classification system to underpin interpretation of data, site assessment and management of marine areas.
5. **Comparing and evaluating locations** Comprehensive data sets enable objective assessment and comparison of locations to be carried out based on their scientific merits. Computer-aided analysis facilitates this evaluation.
6. **Identifying locations and species of marine natural heritage importance** Following broad-scale survey, undertaken by standard methods, the MNCR identifies

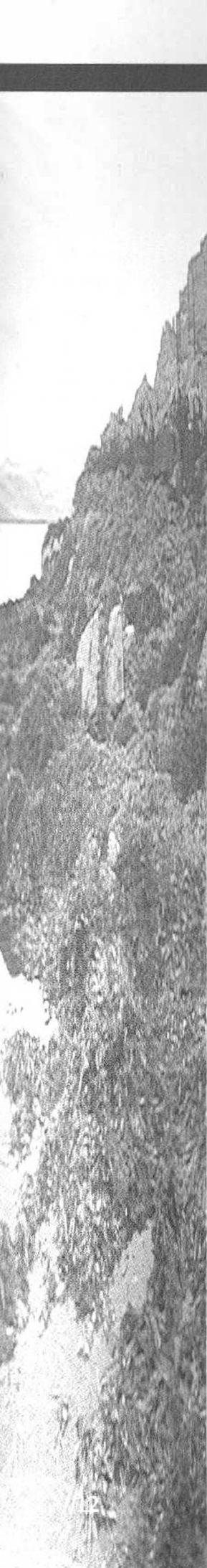
locations of high marine natural heritage value within each coastal sector through a standard assessment protocol. The protocol can also be used to assess the marine natural heritage importance of sites proposed for development or where potentially damaging activities might be undertaken. Records held on the MNCR database can be used to assess species distribution and rarity.

7. **Publishing results** The results of MNCR field surveys are disseminated for use by conservation organisations. Until 1994, dissemination was through reports of each separate field survey. The MNCR now produces a variety of publications to suit regional and national requirements for information on marine management, nature conservation and marine ecology. A report series provides information for each of the 15 coastal sectors and includes:
 - A biotope classification** A classification for the MNCR coastal sector or major physiographic type of coast. The classification contributes to the national MNCR classification.
 - Area summaries** An account of each physiographically similar stretch of open coast, marine inlet or lagoon within the sector.
 - Conservation assessment** A comparative assessment of the nature conservation quality of each stretch of open coast, marine inlet or lagoon within the MNCR coastal sector.
 - Overview** An account of the major physical and biological features of the entire MNCR coastal sector or major physiographic type of coast incorporating or taking account of non-MNCR work.



The distribution of biotopes in The Swale, Kent.





Box 4: A classification of benthic marine biotopes is being prepared to:

- provide a framework in which to place results from ecological surveys;
- provide a common language for describing the physical and biological character of the benthic marine environment;
- facilitate mapping of the distribution, frequency of occurrence and extent of biotopes at regional, national and international levels;
- allow the succinct description of the range of biotopes within a given area;
- provide a basis for comparative assessment of species composition and richness in the same biotope occurring at a range of sites;
- provide a basis for predicting the biological character of an area based on its physical environment;
- underpin coastal zone and sea use management by providing a better basis for assessment of scientific interest, nature conservation importance and sensitivity of areas to a range of different impacts, uses and developments; and
- aid management of rare species by placing them in the context of their associated biotopes.

Box 5: Criteria for assessment of nature conservation importance and for site selection

Scientific/ecological criteria used in the MNCR	Further scientific/ecological criteria	Practical criteria
Situation	Species richness	Integrity (structure & function)
Biotope richness	Irreplaceability	Recorded history
Representativeness	Sensitivity	Research and educational potential
Naturalness	Risk of extinction	Restoration potential
Species rarity	Dependency	Intrinsic appeal
Biotope rarity (incorporating extent)	Productivity	Vulnerability
		Urgency
		Feasibility
		Socio-economic effects

Reports and papers are also published describing the development of MNCR work and methods. MNCR information is incorporated into publications such as the Coastal Directories series

being undertaken by JNCC and disseminated through the electronic publication UKDMAP. Further publications, both on paper and through electronic media, are planned.

A list of reports published by the MNCR is available from: The Enquiry Officer, Marine Conservation Branch, Joint Nature Conservation Committee, Monkstone House, Peterborough PE1 1JY, UK.